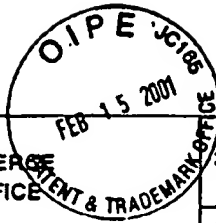


EXHIBIT 1

FORM PTO-1449
Inventor "Lars Friedrich"
Filing date 08/31/2000.



FORM PTO-1449 U.S. DEPARTMENT OF COMMERCE
(Modified) PATENT AND TRADEMARK OFFICE

INFORMATION DISCLOSURE
STATEMENT BY APPLICANT

(Use several sheets if necessary)

(37 CFR 1.98(b))

ATTY. DOCKET NO.
326

SERIAL NO.
09/651,140

APPLICANT: Lars Friedrich

FILING DATE: 08/31/00

GROUP: ~~Unassigned~~

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL	PATENT NUMBER							ISSUE DATE	PATENTEE	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
AB	6	0	8	8	1	5	2	07/11/00	Berger, et al.	359	334	
AB	5	0	3	9	1	9	9	08/13/91	Mollenauer, et al.	359	334	
AB	5	4	0	6	4	0	4	04/11/95	DiGiovanni, et al.	359	161	
AB	6	0	5	2	2	1	9	04/18/00	Kidorf, et al.	359	334	
AB	5	8	8	3	7	3	6	03/16/99	Oshima, et al.	359	341	
AB	6	0	4	0	9	3	3	03/21/00	Khaleghi, et al.	359	124	
AB	5	2	2	5	9	2	2	07/06/93	Chraplyvy, et al.	359	124	
AB	5	9	5	9	7	5	0	09/28/99	Eskildsen, et al.	359	134	
AB	5	8	4	7	8	6	2	12/08/98	Chraplyvy, et al.	359	164	
AB	6	0	3	8	3	5	6	03/14/00	Kerfoot, III, et al.	385	24	
AB	6	1	1	5	1	7	4	09/05/00	Grubb, et al.	359	334	

FOREIGN PATENT OR PUBLISHED FOREIGN PATENT APPLICATION

		DOCUMENT NUMBER							PUBL. DATE	COUNTRY OR PATENT OFFICE	CLASS	SUBCLASS	TRANSLATION	
													YES	NO

OTHER DOCUMENTS (Including Author, Title, Date**, Relevant Pages, Place of Publication***)

AB			A. M. Hill, et al., "Nonlinear Crosstalk Due to Stimulated Raman Scattering in a Two-Channel Wavelength-Division-Multiplexed System", Electronics Letters, Vol. 20, No. 6, 1984

EXAMINER

ABell

DATE CONSIDERED

9/16/03

EXAMINER: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

EXHIBIT 2

U.S. Patent No. 6,466,362 B1

Serial No. 09/651,840

Inventor "Lars Friedrich"

Filing date 08/31/2000



US006466362B1

(12) **United States Patent**
Friedrich(10) Patent No.: **US 6,466,362 B1**
(45) Date of Patent: **Oct. 15, 2002**(54) **HYBRID AMPLIFIER AND CONTROL METHOD HEREFOR THAT MINIMIZES A NOISE FIGURE FOR PARTICULAR SPAN LOSS**(75) Inventor: **Lars Friedrich, Glen Burnie, MD (US)**(73) Assignee: **Ciena Corporation, Linthicum, MD (US)**(*) Notice: **Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.**(21) Appl. No.: **09/651,840**(22) Filed: **Aug. 31, 2000**(51) Int. Cl.⁷ **H01S 3/30**(52) U.S. Cl. **359/334; 359/341.1; 359/337**(58) Field of Search **359/341.41, 341.42, 359/334, 337, 337.4**(56) **References Cited****U.S. PATENT DOCUMENTS**

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Assistant Examiner—Stephen Cunningham

(74) Attorney, Agent, or Firm—Michael R. Cammarata

(57) **ABSTRACT**

A hybrid amplifier reduces the noise generated by the hybrid amplifier. The hybrid amplifier includes a rare-earth doped fiber amplifier such as an EDFA (erbium-doped fiber amp), a Raman amplifier, a controller and a memory device. Noise is reduced by determining a gain balance between the EDFA and Raman amp that minimizes the noise figure. The controller performs a method that generates a plurality of functions relating the hybrid amp noise figure and the Raman gain for a particular span loss. These functions are then utilized to determine the Raman gain portion of the gain balance that minimizes the noise figure. The remaining portion of the gain balance is made up by the EDFA. For a hybrid amplifier that will see only one span loss value, then only one such function needs to be generated. Furthermore, the memory device of the hybrid amplifier can be programmed to store an optimum control curve that minimizes the noise figure for one or a plurality of span losses.

13 Claims, 8 Drawing Sheets

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